ICESat (GLAS) Science Processing Software Document Series

Volume
GSAS Version Description
Version 3.0

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Foreword

This document contains the GLAS Science Algorithm Software (GSAS) Version Description document. This document is developed under the structure of the NASA STD-2100-91, a NASA standard defining a four-volume set of documents to cover an entire software life cycle. Under this standard a section of any volume may, if necessary, be rolled out to its own separate document. This document is a roll- out of the user guide within the Product Specification Volume.

The GEOSCIENCE LASER ALTIMETER SYSTEM (GLAS) is a part of the EOS program. This laser altimetry mission will be carried on the spacecraft designated EOS ICESat (Ice, Cloud and Land Elevation Satellite). The GLAS laser is a frequency-doubled, cavity-pumped, solid state Nd:YAG laser.

This document was prepared by the Observational Science Branch at NASA GSFC/ WFF, Wallops Island, VA, in support of B. E. Schutz, GLAS Science Team Leader for the GLAS Investigation. This work was performed under the direction of David W. Hancock, III, who may be contacted at (757) 824-1238, hancock@osb.wff.nasa.gov (e-mail), or (757) 824-1036 (FAX).

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Introduction

1.1 Identification of Document

This is the Version Description document for the Version 3.0 delivery of the GLAS Science Algorithm Software (GSAS). The unique document identification number within the GLAS Ground Data System numbering scheme is TBD. Successive editions of this document will be uniquely identified by the cover and page date marks.

1.2 Scope of Document

The GLAS I-SIPS Data Processing System, shown in Figure 1-1, provides data processing and mission support for the Geoscience Laser Altimeter System (GLAS). I-SIPS is composed of two major software components - the GLAS Science Algorithm Software (GSAS) and the Scheduling and Data Management System (SDMS). GSAS processes raw satellite data and creates EOS Level 1A/B and 2 data products. SDMS provides for scheduling of processing and the ingest, staging, archiving and cataloging of associated data files. This document is the Version Description for the GSAS Version 3 delivery.

1.3 Purpose and Objectives of Document

The purpose of this document is to provide a precise description of the Version 3.0 delivery of GSAS.

1.4 Document Organization

This document's outline is assembled in a form similar to those presented in the NASA Software Engineering Program [Information Document 2.3a].
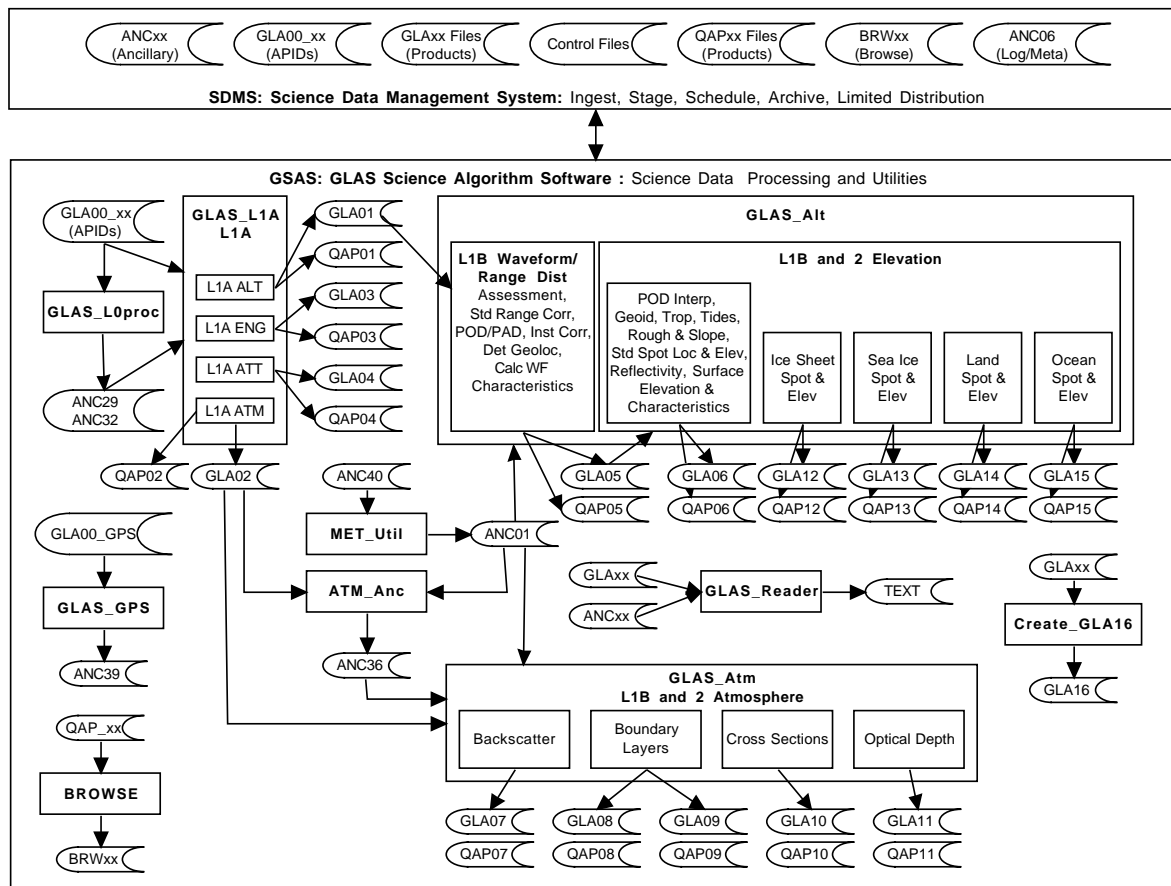
Figure 1-1 I-SIPS Software Top-Level Decomposition

1.5   Document Change History

Document Name: GLAS Science Algorithm Software Version Description		
Version Number	**Date**	**Nature of Change**
Version 0	July 1999	Original Version.
Version 1	November 2000	Revised for V1 software.
Version 2	November 2001	Revised for V2 software.
Version 2.2	July 2002	Revised for V2 software.
Version 3.0	October 2002	Revised for V3 software.

Related Documentation

2.1 Parent Documents

Parent documents are those external, higher-level documents that contribute information to the scope and content of this document. The following GLAS documents are parent to this document.

a) *GLAS Science Software Management Plan* (GLAS SSMP), Version 3.0, August 1998, NASA Goddard Space Flight Center, NASA/TM-1999-208641/VER3/VOL1.

The GLAS SSMP is the top-level Volume 1 (Management Plan Volume) document of the four volumes of NASA software engineering documentation [Applicable Reference 2.2c]. It dictates the creation and maintenance of the Product Specification Volume (Volume 2). This document is a roll out of the Product Specification Volume.

2.2 Applicable Documents

a) NASA Software Documentation Standard Software Engineering Program, NASA, July 29, 1991, NASA-STD-2100-91.

b) GLAS Science Algorithm Software Detailed Design Document, Version 3.0, October 2002, NASA Goddard Space Flight Center.

c) GLAS Science Algorithm Software User's Guide, Version 4.0, October 2002, NASA Goddard Space Flight Center.

d) GLAS ISIPS Operational Procedures Manual, TBD.

2.3 Information Documents

a) GLAS Science Telemetry Packets Definition Document, Revision B, October 11, 2000, NASA Goddard Space Flight Center, GLAS-582-SPEC-002.

b) GLAS Standard Data Products Specification - Level 1, Version 6.0, October 2002, NASA Goddard Space Flight Center Wallops Flight Facility, GLAS-DPS-2621.

c) GLAS Standard Data Products Specification - Level 2, Version 6.0, October 2002, NASA Goddard Space Flight Center Wallops Flight Facility, GLAS-DPS-2641.

d) GLAS Science Data Management Plan (GLAS SDMP), Version 4.0, June 1999, NASA Goddard Space Flight Center Wallops Flight Facility, GLAS-DMP-1200.

e) Derivation of Range and Range Distributions From Laser Pulse Waveform Analysis for Surface Elevations, Roughness, Slope, and Vegetation Heights, Version 3.0, July 2000, NASA Goddard Space Flight Center, et al.

f) Precision Orbit Determination (POD), Version 2.2, October 2002, University of Texas Center for Space Research.

g) Precision Attitude Determination (PAD), Version 2.2, October 2002, University of Texas Center for Space Research.

h) Atmospheric Delay Correction to GLAS Laser Altimeter Range, March 2001, NASA Goddard Space Flight Center, et al.

i) Ocean Tidal Loading Corrections, Version 1.0, February 1999, NASA Goddard Space Flight Center, et al

j) Laser Footprint Location (Geolocation) and Surface Profiles, Version 3.0, October 2002, NASA Goddard Space Flight Center, et al

k) Atmospheric Data Products, Version 4.2, June 2001, NASA Goddard Space Flight Center, et al

l) The Algorithm Theoretical Basis Document for Level 1A Processing, Version 1.0, October 2002, NASA Goddard Space Flight Center/Wallops Flight Facility.

Product Description

3.1   Purpose

GSAS generates the GLAS Standard Data Products and associated metadata describing the products and their quality. The software uses GLAS telemetry and ancillary data to produce the products using algorithms defined by the GLAS Science Team.

GSAS is delivered as a set of libraries and executables (PGEs). The design and structure of GSAS is fully described in the GSAS Detailed Design Document.

Throughout this document, files are referenced as one of two types: GLA or ANC. GLA files are integer-binary format product files containing Level 0-2 GLAS science data. The GLA files are fixed-length binary files containing scientific measurements. GLA files are both input and output to GSAS. ANC files are multi-format ancillary files supplied by the science team which are required for processing. These files are detailed in the GLAS Data Management Plan and GLAS Standard Data Product Specifications Documents.

3.2   Environment

GSAS software is developed for and delivered on the UNIX platform. This document assumes that the reader is familiar with UNIX operating system conventions. The software is currently supported only on the HP/UX 11.0 operating system with Fortran 90 version v2.5.

3.3   Functions

The GSAS functions for V3.0 are:

- Read GLAS telemetry data and standard data products and ancillary files. Provide time-synchronization between product and ancillary files and between multiple products.

- Create all standard data products in an integer-binary format. These data products are grouped into the following categories:

  - Level-1A products. (GLA01-04)

  - Waveform products. (GLA05)

  - Atmosphere products. (GLA07-11)

  - Elevation products. (GLA06, GLA12-15)

- Perform selective processing based on input and output defined in a user-supplied control file.

- Creates EOS inventory metadata files.

- Maintain a full processing history.

- Report errors and messages in a standardized fashion with user-defined options available.

- Read changeable parameters from Science Team-supplied ancillary files.

- Convert product data into human-readable output.

- Create sample (but not scientifically accurate) test products.

3.4   Restrictions and Limitations

The V3.0 delivery of the GSAS has the following limitations:

- The software has the capability of processing many different scenarios. However, only tested scenarios are supported. These scenarios are:

    - One processing string to create all L1A products (GLA00 to GLA01-04).

    - One processing string that starts with an L1A altimetry product (GLA01) input to produce a waveform product (GLA05).

    - One processing string that starts with a waveform product (GLA05) input to produce all elevation products (GLA06, 12,13,14,15).

    - One processing string that starts with L1A atmosphere (GLA02) input and produces L2 atmosphere products (GLA07,08,09,10,11).

- GLA16, and the associated processing software, while referenced in documentation, is not present in the V3.0 delivery.

- Not all utility PGEs conform with GSAS standards regarding control files, file naming, error reporting, and processing history.

- GSAS core and utility PGEs may be run without error if all ANC07 files specified within the control file. Only specific ANC07 files are required for each PGE, but we have verified that specifying all does not cause an error. This capability was verified in order to avoid a potential SDMS limitation.

- GSAS will **not overwrite** existing files.The software will halt with a fatal error unless old output files are removed before execution.

- No process sanity checking is delivered in this version. This will be added in a later delivery.

- The GSAS is supported on HP/UX 11.0 with HP Fortran 90 compiler version 2.5.

- In a production environment, the GSAS would be controlled by the SDMS. The SDMS would produce control files, stage data, and control execution of the GSAS binaries. This document, however, is limited to GSAS and thus will not describe procedures within the scope of SDMS.

Inventory and Product

4.1   Materials Released

Materials released include software code, documentation, static ancillary data and test data. These materials are delivered on physical media. Due to the size of ancillary and test data, a DLT tape shall be used as the distribution media. The documentation is delivered in form of Adobe PDF (Portable Document Format) files and, by request, hardcopy.

4.2   Product Content

To extract the GSAS Version 3.0 software, change to an appropriate directory (suggested at least 10GB available on the disk) and use the tar command to extract the software from distribution media.

When the tape is un-tarred, a gsas_v3.0 directory and several sub-directories will be created. Table 4-1 lists the top-level subdirectories.

Table 4-1   Top-level Content

Item	Description
bin	Directory where executables are stored.
cc_util	Make utilities.
data	Science-team provided static-ancillary files and sample control files.
docs	Documentation in PDF format.
lib	Directory where shared libraries are stored.
Makefile	Distribution Makefile.
src	Source code.
test	Sample products and testing area.

The bin and lib directories are delivered without content. They will be populated during the installation process. The remainder of this subsection describes content of the other directories.

4.2.1   Makefile utilities (cc_util)

This directory contains GSAS-standard makefile utilities. These files are used in GSAS makefiles and can be modified to change such things as compile-time options in a consistent manner.

Table 4-2   cc_util Content

Item	Description
cc_make_final.sh	Clearcase glue script to ease installation.
make_defs.	Symbolic link to make_defs.hp
make_defs.hp	HP-specific Makefile definitions.
make_defs.incl	Generic Makefile definitions.
make_depends.incl	Makefile dependencies.

4.2.2   Ancillary Data (data)

Initial versions of the science-team supplied ancillary data files as well as sample control files are included in this release. These files are located in the data directory of the tarfile and are designated Version 3.0.

Table 4-3   data Content

Item	Version	Description
anc07_001_00_00.dat	3.0	Error and Status file. Generated by development team.
anc07_001_00_01.dat	3.0	Global constants file. Generated by development team.
anc07_001_00_02.dat	3.0	Atmosphere constants file. Generated by development team.
anc07_001_00_03.dat	3.0	Elevation constants file. Generated by development team.
anc07_001_00_04.dat	3.0	Waveform constants file. Generated by development team.
anc07_001_00_05.dat	3.0	L1A constants file. Generated by development team.
anc07_001_00_06.dat	3.0	Utility constants file. Generated by development team.
anc12_001_00_00.dat	n/a	DEM header. Generated by development team from anc12_001_00_01.dat.
anc12_001_00_01.dat	n/a	DEM. From GTOPO30 (U.S. Geological Survey's EROS Data Center)
anc13_001_00_00.dat	n/a	Geoid. EGM96.
anc16_001_00_00.dat	n/a	Load Tide Model file. This was provided by the science team. SPOTL (Duncan Agnew -- SCRIPPS)
anc17_001_00_00.dat	n/a	Ocean Tide Model file. This was provided by the science team. GOT99.2 (Richard Ray -- GSFC)

Table 4-3   data Content (Continued)

Item	Version	Description
anc18_001_00_00.dat	n/a	Standard Atmosphere file. Standard Atmosphere profile file, in house. Pressure and temperature based on LOWTRAN radiative transfer program. Humidity based on Anderson, G. P., S. A. Clough, F. X. Kneizys, J. H. Chetwynd, and E. P. Shuttle, 1986: AFGL atmospheric constituent profiles (0-120 km), AFGL-TR-86-0110, 43 pp. [NTIS ADA175173]
anc25_001_00_00.dat	n/a	Sample GPS/UTC files tuned for GSAS sample data.
anc30_001_00_00.dat	n/a	Global aerosol categorization map file. This was provided by the science team.
anc31_001_00_00.dat	n/a	Aerosol tropospheric classification map file. This was provided by the science team.
anc33_001_00_00.dat	n/a	Sample IST Interface file tuned for GSAS sample data.
anc45_*.dat	n/a	Product Metadata Template File. Produced for each product type by the development team.
anc46_*.dat	n/a	Ancillary Metadata Template File. Produced for each supported ANC type by the development team.

4.2.3   Documentation (docs)

The required delivery documentation for Version 2.2 is found in the docs directory. These documents are listed in Table 4-4

Table 4-4   docs Content

Item	Version	Description
atbd_waveform.pdf	3.0	ATBD - Derivation of Range and Range Distributions From Laser Pulse Waveform Analysis for Surface Elevations, Roughness, Slope, and Vegetation Heights
atbd_pod.pdf	2.1	ATBD - Precision Orbit Determination (POD)
atbd_pad.pdf	2.1	ATBD - Precision Attitude Determination (PAD)
atbd_tropo.pdf	1.0	ATBD - Atmospheric Delay Correction to GLAS Laser Altimeter Ranges
atbd_tide.pdf	1.0	ATBD - Ocean Tidal Loading Corrections
atbd_geolocation.pdf	2.0	ATBD - Laser Footprint Location (Geolocation) and Surface Profiles
atbd_atmos.pdf	2.0	ATBD - Atmospheric Data Products
atbd_l1a.pdf	0.2D	ATBD - Level 1A Processing
gsas_ddesign_v3.pdf	2.0	GSAS Detailed Design Document, Version 2.

Table 4-4   docs Content

Item	Version	Description
gsas_user_guide_v3.pdf	2.0	GSAS User's Guide, Version 2.
gsas_ver_desc_v4.pdf	2.0	GSAS Version Description, Version 2 (this document).
glas_prod_spec_1_v6.pdf	4.0	GLAS Standard Data Product Spec - Level 1
glas_prod_spec_2_v6.pdf	4.0	GLAS Standard Data Product Spec - Level 2
glas_smp_v2.pdf	3.0	GLAS Science Software Management Plan
glas_dmp_v2.pdf	4.0	GLAS Data Management Plan
udf.tar	2.0	Tarfile snapshot of the Unit Development Folders.

4.2.4   Source (src)

Contents of the src directory are described in detail within the GSAS Detailed Design Document. Table 4-5 lists each major subdirectory and it's corresponding executable/library version number.

Table 4-5   src Content

Item	Version	Description
atm_lib	3.0	Links atmosphere code into library structure.
atmosphere	3.0	Development code for atmosphere code.
elev_lib	3.0	Links elevation code into library structure.
elevations	3.0	Development code for elevations code.
GLAS_L0proc	3.0	GLAS L0 PGE
GLAS_L1A	3.0	GLAS L1A PGE
GLAS_Atm	3.0	GLAS Atmosphere PGE
GLAS_Alt	3.0	GLAS Altimetry PGE
GLAS_GPS	3.0	GLAS GPS processor
GLAS_Meta	3.0	GLAS Metadata processor
met_util	n/a	Met file Utility
atm_anc	n/a	Atmosphere Utility
createGran_util	n/a	Granule Utility
refOrbit_util	n/a	Reference Orbit Utility
GLAS_Reader	3.0	GLAS Reader Utility
lib	3.0	Development shared library directory. (initially empty)
l1a	n/a	<unused>

Table 4-5   src Content (Continued)

Item	Version	Description
l1a_lib	3.0	Development directory for L1A code
Makefile	3.0	Master source Makefile
modules	n/a	Development module directory. (initially empty.)
waveforms	3.0	Development directory for waveforms code
wf_lib	3.0	Links Waveforms code into library structure.
common_libs/anc_lib	3.0	Development directory for anc_lib.
common_libs/cntrl_lib	3.0	Development directory for cntrl_lib.
common_libs/err_lib	3.0	Development directory for err_lib.
common_libs/file_libt	3.0	Development directory for file_libt.
common_libs/geo_libt	3.0	Development directory for geo_libt.
common_libs/math_lib	3.0	Development directory for math_lib.
common_libs/platform_lib	3.0	Development directory for platform_lib.
common_libs/prod_lib	3.0	Development directory for prod_lib.
common_libs/time_lib	3.0	Development directory for time_lib.

4.2.5   Testing and Sample Products (test)

The V3.0 delivery version contains, within the test directory, test data and facilities for use in validating correct operation of the delivered software. The content and usage of the test directory is documented in the GSAS Users Guide.

Change Status

The Version 3.0 delivery of GSAS contains major changes from Version 2. The most important changes are changes to reflect updated ATBDs and new functionality provided by additional PGEs.

5.1 Installed Changes

5.1.1 Science Algorithms

Implemented changes defined in the latest version of the science algorithm ATBDs. These changes are documented in each respective ATBD. The latest ATBDs are available at:

http://www.csr.utexas.edu/glas/atbd.html

and

http://glas.wff.nasa.gov/docs (L1A).

The versions implemented in the V3.0 delivery are included as PDF files in the 'docs' directory of this distribution. The following table lists the version of each ATBD used for V3.0 development.

Table 5-1   ATBD Versions Implemented in V3.0

Title	Version
Derivation of Range and Range Distributions From Laser Pulse Waveform Analysis for Surface Elevations, Roughness, Slope, and Vegetation Heights	July 2000
Precision Orbit Determination (POD)	October 2002
Precision Attitude Determination (PAD)	October 2002
Atmospheric Delay Correction to GLAS Laser Altimeter Ranges	March 2001
Ocean Tidal Loading Corrections	February 1999
Laser Footprint Location (Geolocation) and Surface Profiles	October 2002
Atmospheric Data Products	June 2001
The Algorithm Theoretical Basis Document for Level 1A Processing	October 2002

5.1.2 Data Products

Version 3.0 of the data products were implemented as described in the GLAS Standard Data Product Specifications - Level 1 and 2 and the respective ATBDs.

The content and description of the as-implemented Level 1 and 2 products is available at:

http://glas.wff.nasa.gov/v3_products

The content and description of the as-implemented Level 0 APID data is available at:

http://instra2.gsfc.nasa.gov/glas_doc/glas-582-spec-002e.pdf (science)

http://instra2.gsfc.nasa.gov/glas_doc/glas-582-spec-005c.pdf (engineering)

5.1.3   GLA04 Timing and Sub-packet Alignment

GLA04 precision time computation was implemented. GLA04 sub-packet time/data alignment was delivered.

5.1.4   GLA03/L_Eng

Engineering data processing (L_Eng) and the resultant GLA03 product support was delivered.

5.1.5   GLAS_Meta

The ability to create Ancillary file inventory-level metadata was added to GLAS_Meta.

5.1.6   File Naming Convention

The supported file naming convention was changed. See Appendix A of the GSAS User Guide.

5.1.7   GLAS_L0proc

Several error checks were added to GLAS_L0proc. Added flag byte to ANC32 file The ANC32 creation mechanism was revised to use FTLatch for the GPS update detection.

5.1.8   GLAS_L1A

GLA01 and GLA02 formats and processing software was modified to support the new APID definitions. Support was added for L_Att processing. L_Atm processing was modified to work with new Atmosphere algorithms. Shottime calculation was rewritten for improved maintainability. Instrument biases are now handled.

5.1.9   GLAS_Atm

Atmosphere algorithms were significantly re-written.

5.1.10   GLAS_Alt Waveforms

Waveform algorithms were significantly re-written. Parameter values were tuned to reflect instrument characteristic.

5.1.11   GLAS_Alt Elevations

Added surface-type support to the elevation science algorithms.

5.1.12   Utilities

atm_anc, met_util, refOrbit_util, and createGran_util were updated. A new utility, stripper, was written to assist in processing spacecraft test data.

5.1.13   Implemented PR/CRs

The software development team uses Change Requests (CR) and Problem Reports (PR) to identify problems in the software.Table 5-2 lists those PR/CRs addressed in GSAS 3.0.

Table 5-2   PR/CRs Addressed in Version 3.0

PR/CR	Short Description
20020702-001	GLA04 meta data file
20020708-001	Add dithering information to gla07
20020715-001	Revision to ANC32 creation algorithm
20020717-001	Only One ANC09 File Is Being Read Instead Of Two
20020719-002	Temp fix for MOSS8 to increase size of QA array in L_ATMQA_Trnd_mod.f90
20020719-001	Modify File naming convention
20020724-002	L1A to handle instrument biases
20020724-001	GLA04 Metadata remove LocalGranuleID
20020725-002	elevation mgr application of timing and range biases
20020725-001	waveform mgr changes for applying timing and range biases
20020729-001	8ns peak value needed in qa
20020731-001	Elementary sanity checking added to GL0P
20020802-003	GL0P record index offset
20020802-002	Modify createGran utility so that if data starts somewhere on segment 4, assign correct track number
20020805-003	GLA05 V3 format changes
20020805-002	QA for %wf so signal should be calculated using only long or short wf packet #s, not sum
20020806-001	All l_WFqual%maxiter Flags Are Set True
20020809-002	Time align the LRS and IST data with GLA01 and LPA
20020809-001	Update GLA04 processing and formats for launch version
20020812-001	Change in QA for GLA02
20020813-001	Ending date on .met files wrong when data spans day boundary
20020815-001	GLAS_Meta needs to write Metadata files for delivered ANC files.

Table 5-2   PR/CRs Addressed in Version 3.0 (Continued)

PR/CR	Short Description
20020820-001	GLAS_Meta does not increment output record counter
20020821-001	Only need to compute POD once in L1AManager
20020822-002	V3 format changes for GLA06, 12-15
20020822-001	Subroutines in W_FunctionalFt_mod Need to Handle invalid d_bg_Noise & d_sDevNoise
20020828-001	Modify met_util to take into account the new file naming convention
20020906-001	Array size too small
20020909-004	LRS and IST time
20020909-002	Implement secondary header APID verification
20020911-003	Modify CreateGran utility to include GPS-UTC leap secs table.
20020911-002	On V3 products, DEM_elev should have consistent units.
20020911-001	APID MET offsets need to be changed per the science team.
20020912-001	Create a utility to subset GLA00 APIDs
20020917-001	QA Histogram Errors for W_FunctionalFt & ElevMgr
20020918-002	Update GLA01-03 for final telemetry formats
20020918-001	new attitude flag needs to be added to GLA07-11
20020920-002	errors in V3 GLA05 parameter data base
20020923-002	L1A constants file needs new value for gd_volt_offset
20020924-001	ANC07 waveform parameter changes requested for MOSS10
20021008-001	sign of internal range bias - bias of 9.5m must be added to measured range
20021016-004	wrong invalid values used in GLA10 scale module
20021016-002	WFMgr Needs To Check For The Existence of ANC09 Before Using It
20021016-001	Wrong Invalids Used In Scale Mods
20021021-003	lrs tracker subject error
20021021-001	ANC32 not synchronizing with data
20021022-003	Did not merge the fix in met utility to take into account 4 digit ffff (pr20020828-001)
20021022-001	Modify C_CalcSpLoc and C_IntrpPOD to compare UTC time vs time on control file (in UTC)

Table 5-2   PR/CRs Addressed in Version 3.0 (Continued)

PR/CR	Short Description
20021023-002	Modify createGran utility so that it does not convert UTC/GPS and vice-versa if time is zero
20021030-002	LRS and IST data time additions

5.2   Waivers

- Detailed Design/User Guide documentation for most subsystems and utilities is not updated.

- No Integration Test document has been delivered.

- No Acceptance Test document has been delivered.

- Delivery validation software and data is not delivered.

- Not all scenarios specified in the Requirements document are tested.

- GLA16 support is not delivered.

- Precision time calculation when GPS is not present is not yet coded.

- Several PR/CRs have been suspended for a later version.

5.3   Possible Problems and Known Errors

Table 5-3 lists the PRs and CRs open for V3.0. These will be corrected in a later delivery.

Table 5-3   Open or Suspended PR/CRs for Version 3.0

PR/CR	Short Description
20020301-001	Sanity Check ANC29 to GLA00
20020409-001	Global variable gi_fname_len needs to be made larger
20020411-001	move anc file open code from openfiles to read_anc
20020510-004	CLoud peak, ground ret and grn bin
20020514-001	Need better check for start of processing in managers
20020607-001	Modify prod_ver to do diff on QAP files
20020731-002	GL0P to process the construction record
20020805-001	update IDL browse code for new QAP formats - V3
20020826-001	check elevation/waveform ATBD to make sure all parameters are defined and consistent with code
20020830-002	SPCM "Turn On" Gain Correction

Table 5-3   Open or Suspended PR/CRs for Version 3.0 (Continued) (Continued)

PR/CR	Short Description
20020830-001	Range Delay Due to Multiple Scattering
20020909-003	Header QA info
20020909-001	V and V software needs to perform basic limit check on important parameters as part of operational QA
20020916-001	Add time series of calibration constants to QA for GLA07
20020920-001	incorrect calculation of histograms
20020923-001	GLA06, 8 header problems
20021002-001	Check Flags for Launch-Ready Status
20021007-001	GLA04 gyro values handle unsigned values in wrong way.
20021009-001	Errors found in QAP 05.
20021016-003	PAD Description Incorrect
20021018-001	Change In Criteria For Waveform Saturation
20021021-007	532 Channel Dead Time Correction Enhancement
20021021-006	1064 Cloud Digitizer "Droop" Correction
20021021-005	Generation of cloud layers from 1064 channel
20021023-004	for public documentation of data formats show only product variable information remove reference to algorithm variables
20021023-003	put internal range delay, post-launch range bias, and post launch timing bias in header records
20021023-001	Cloud Layer Detection Enhancement
20021024-002	limit idl usage by jobs
20021024-001	QAP problems with GLA08-GLA11
20021025-003	Changes in APID1984 and GLA04
20021025-001	MOSS10 error in running GLAS_Atm (No ANC36 data for current granule time)
20021028-001	QAP error in GLA6 and 12-15
20021030-001	New PRAP format

5.4   Requirements Not Supported in the V3 Delivery

Requirements from the GLAS Science Software Requirements Document that are not supported in the V3 delivery of the I-SIPS software are shown in Table 5-4.

Table 5-4   Requirements Not Supported

Requirements Number	Description	Status
GSDP-30100	The I-SIPS Software will create GLAS standard products that are to be delivered to the DAAC in the format agreed to by ESDIS. (GLA16 creation is not yet delivered).	original
GSDP-31300	Automatic or manual Quality Assurance (QA) is provided for each standard data product and ancillary file. Until QA is completed, the file shall be marked as invalidated. Upon successful completion of QA, the file shall be marked as validated. (GLA03 and GLA04 QAP is not yet delivered.)	original

5.5   Change Notes

The following are detailed change notes distributed for the interim versions of GSAS released since V2.2.

5.5.1   Changes Delivered in V2.3

GSAS 2.3 is a minor release incorporating changes which fix problems found in MOSS8. GSAS v2.3 will be the release used for MOSS9 testing.

The ClearCase label for this release will be RELEASE_2.3.

The following is a list of changes implemented into v2.3. See the appropriate CATU entry for more information regarding each specific change.

- CR20020802-002 : Modify createGran utility so that if data starts somewhere on segment 4, assign correct track number.

The createGran utility need to be modified so that during a new instance, if the first data point is somewhere in segment 4, we need to check if it is before or after the equator. If it is after the equator, the track number needs to be one less that the one calculated. This is because segment 4 starts at -50 deg lat. on the ascending node. The code currently does not do this subtraction.

- CR20020731-001: Elementary sanity checking added to GL0P.

Some bad data records are making it to the L1A processing. We need to add some sanity checking on the APID19 and maybe other packets that would prevent that packet from appearing in the anc29 file and therefore will not be processed by L1A. Any record "edited" out needs to be error reported. Suggested checks for APID 19.

- Check VTCW, MET and GPS time are within the start/stop time for the file.

Check first shot number, shot number near GPS, and shot number near time and position message to make sure they are within 1 to 200.

- IPR20020724-001:GLA04 Metadata remove LocalGranuleID.

The GLA04 metadata should not contain a LocalGranuleID section since it is a multi-file granule.

- PR20020719-002: Temp fix for MOSS8 to increase size of QA array in L_ATMQA_Trnd_mod.f90.

During MOSS8 we had errors running the L1A process. The errors were "Array index is greater that size allowed, ATMQA%OUT%i_lat_num > i_num_latlon". This was occurring because there was more data in the granule than anticipated. I upped the size of the i_gran_sec variable from 12000 to 120000 to increase the array size by a factor of 10. This caused the program to run. It is only a temporary fix for MOSS8 and needs to be addressed for future versions.

- CR20020719-001: Modify File naming convention.

A new file naming convention for QAP and some other file extensions has been defined. GLAS_exec and possible some processes need to be modified to properly implement it. See Suneel's 7/19/02 memo on file naming in the UDF.

- PR20020717-001: Only One ANC09 File Is Being Read Instead Of Two.

ANC09 files were provided but only the first one was being read. The elevations calculated using the first file were correct, but those that should have used data from the second ANC09 were not correct. The code in ReadRecord was not checking for an EOF condition.

- IPR20020813-001: Ending date on .met files wrong when data spans day boundary.

We have a problem with the meta data/metafile creation program. When the data in a granule spans more than 1 day, the header records on the granule are correct, the beginning time and date on the metadata is correct, however the ending date is wrong, (the ending time is correct).

5.5.2   Changes in V2.4

GSAS 2.4 is a major release which integrates many bug fixes and significant new functionality. GSAS 2.4 will be the release used for MOSS10 testing.

The ClearCase label for this release will be RELEASE_2.4.

The following is a list of changes implemented into v2.4. See the appropriate CATU entry for more information regarding each specific change.

- PR20020715-001 : Revision to ANC32 creation algorithm.

Due to things seen in spacecraft data (190,191), we need to change the way we create the ANC32 file in GLAS_L0proc. We will change to using FTLatch for update detection. All ANC32 fields will be recorded from the record where FTLatch changes. After a change is recorded, the very next change in GPStime (within 10 seconds). The updated GPSTime should replace the GPSTime currently stored in the ANC32 record.

After the ANC32 array is built, GLAS_L0proc must loop through the array and check differences against multiples of known difference values. If an inconsistency if found, the offending record should be flagged as bad.

Finally, the L1A shot_time routine needs to be modified to ignore flagged ANC32 data.

- PR20020806-001 : maxiter problem.

d_dConv is read from anc07_...04.dat, and is used to determine when a fit has converged. When the % change between iterations of each peak parameter is less than d_dConv then the fit has converged. d_dConv was originally global to all subroutines using const_wf_mod. When the change was made to pass the local-global variables down as arguments, it was left out & was set to 0.0d0 (along with another variable i_miniter, the minimum number of iterations for a fit).

The variables d_dConv & miniter which previously had been passed to subroutines in W_FunctionalFt_mod as global variables are now being read from anc07 and passed as arguments to the subroutines.

- CR20020418-01 : GLA08, GLA09 enhancements, post Release 2.1 software merge

1. Cloud threshold computation was modified to fix a problem existing in prior versions. The nighttime cloud threshold was too low due to a very low noise content of the nighttime signal. A factor was added to the threshold computation that is a function of the background level.

2. Various tests for false positives were included to reduce the occurrence of cloud layers being triggered by noise in the signal.

3. Enhanced the cloud/aerosol discrimination routine to more reliably differentiate between cloud and aerosol layers.

- CR20020802-003 : Recindex offset

CESat will now be launched basically in 2003. The record index field (time to 10ths) will rollover in about 6.8 years so this is 2006 plus. GLAS will last for 5 years, this means record index needs to go into 2008.

Modify the record index computation to include an offset. We will probably set this to a value that makes the record index at launch to be zero. This allows the most in-flight time before we have to deal with a required rollover. (The developer made a decision to implement the offset as a constant in the const_glob_mod. This will (intentionally) force a new software release if the offset is ever changed.)

- Branch pr20011018-004.

L_Atm_mod.f90- All references to QA functions removed from code, leaving only computational software for GLA02 product.

QAP02_mod.f90- New module. Contains all QA relative to GLA02. Designed to be independent from all other modules and collect data just from a GLA02 record. Includes initialization, print, and write routines.

- Branch wpr20011018-004.

L_Alt_mod.f90- All references to QA functions removed from code, leaving only computational software for GLA01 product.

QAP02_mod.f90- New module. Contains all QA relative to GLA01. Designed to be independent from all other modules and collect data just from a GLA01 record. Includes initialization, print, and write routines.

/glas/vob/src/glas_l1a

L1A_Mgr_mod.f90- Removed small amount of code involved in collecting QAP data for GLA01 and GLA02. Added 2 sets of calls to QAP01 and QAP02 modules, with second of each being required to initiate a summary output of the data.

/glas/vob/src/common_libs/anc_lib

anc07_l1a_mod.f90- Added QA-dumping time interval for along-track sampling, and energy histogram bin values for QA.

/glas/vob/src/common_libs/platform_lib

const_l1a_mod.f90- Added QA-dumping time interval for along-track sampling, and energy histogram bin values for QA. Modified print routine accordingly.

/glas/vob/data

anc07_001_01_05.dat- Added default QA-dumping time interval for along-track sampling, and default energy histogram bin values for QA.

- Branch 20020815-001.

GLAS_Meta will now create metadata for ancillary files.   Corresponding input ANC46 files are required for associated ANCxx.met files.

Includes fixes from PR20020820-001 which requests that GLAS_Meta increment the output record counter on the .MET files.

- Branch CR20020809-001.

New formats for GLA04 were implemented. Time computations were performed as defined in the ATBD.

- Branch CR20020809-002.

Shot and image alignment for GLA04 is implemented.

- Branch v2p_eng (AI 200-134).

L_Eng is implemented. All the engineering APIDs need to be fed into GLAS_L0proc and GLAS_L1A. The L_Eng flag needs to be set and GLA03 output files provided in

the L1A control file. All relevant GLA00 engineering APIDs should be fed into GLAS_L0proc and GLAS_L1A. There is not yet a QAP03 defined.

- Branch cr20020822-002pf

GLA05_Pass_mod †† – added Version 3 pass-throughs from 05 product to 06, 12, 13, 14, and 15 products; includes deltagpstmcor, sigmaatt, reflctUncorr, kurt2, skew2, timecorflg parameters; overhauled module organization

GLA06_Pass_mod – added Version 3 pass-throughs from 06 product to 12, 13, 14, and 15 products; includes deltagpstmcor, sigmaatt, tpintensity_avg, tpazimuth_avg, tpeccentricity_avg, tpmajoraxis_avg, reflctUncorr, kurt2, ElvUseFlg, timecorflg, skew2 parameters

- Branch cr20020805-003

GLA05_prod_mod† – added Version 3 variables to structure, print module, and initialization code; includes additions of and/or changes to spare1, deltagpstmcor, sigmaatt, centroidInstr, reflctuncmxpk, tpintensity, tpazimuth, tpeccentricity, tpmajoraxis, sDevFitTr, gval_tx, compRatio, N_val, r_val, spare3, timecorflg, spare4; reorganized and standardized structure and software

GLA05_alg_mod - added Version 3 variables to structure, print module, and initialization code; includes additions of and/or changes to deltagpstmcor, sigmaatt, centroidInstr, reflctuncmxpk, tpintensity, tpazimuth, tpeccentricity, tpmajoraxis, sDevFitTr, gval_tx, compRatio, N_val, r_val, timecorflg; reorganized and standardized structure and software

GLA05_scal_mod† - added Version 3 variables to scaling structure, print module, and initialization code; includes additions of and/or changes to deltagpstmcor, sigmaatt, centroidInstr, reflctuncmxpk, tpintensity, tpazimuth, tpeccentricity, tpmajoraxis, sDevFitTr, gval_tx; use of new routines for flag packing/unpacking; reorganized and standardized structure and software

GLA05_Pass_mod† – a preliminary sub-branch merge with the cr20020822–002pf branch was performed

- Branch cr20020822-002-06

GLA06_prod_mod – added Version 3 variables to structure, print module, and initialization code; includes additions of and/or changes to spare1, deltagpstmcor, sigmaatt, tpintensity_avg, tpazimuth_avg, tpeccentricity_avg, tpmajoraxis_avg, spare2, spare3, reflctUncorr, SigmaElv, kurt2, skew2, ElvUseFlg, SurfRuf_slpQF, elvflg, rng_UQF, atmQF, timecorflg, OrbFlg, RngCorrFlg, CorrStatFlg, spare5; reorganized and standardized structure and software

GLA06_alg_mod - added Version 3 variables to structure, print module, and initialization code; includes additions of and/or changes to spare1, deltagpstmcor, sigmaatt, tpintensity_avg, tpazimuth_avg, tpeccentricity_avg, tpmajoraxis_avg, reflctUncorr, SigmaElv, kurt2, skew2, ElvUseFlg, SurfRuf_slpQF, elvflg, rng_UQF,

atmQF, timecorflg, OrbFlg, RngCorrFlg, CorrStatFlg; reorganized and standardized structure and software

GLA06_scal_mod - added Version 3 variables to scaling structure, print module, and initialization code; includes additions of and/or changes to spare1, deltagpstmcor, sigmaatt, tpintensity_avg, tpazimuth_avg, tpeccentricity_avg, tpmajoraxis_avg, reflctUncorr, SigmaElv, kurt2, skew2; use of new routines for flag packing/unpacking; reorganized and standardized structure and software

GLA06_flags_mod - removed flag packing/unpacking routines for use elsewhere in the common_flags module; this action left the GLA06 flags routine as essentially a stub

GLA06_Pass_mod – a preliminary sub-branch merge with the cr20020822–002pf branch was performed

- Branch cr20020822-002-12

GLA12_prod_mod – added Version 3 variables to structure, print module, and initialization code; includes additions of and/or changes to spare1, deltagpstmcor, sigmaatt, tpintensity_avg, tpazimuth_avg, tpeccentricity_avg, tpmajoraxis_avg, spare2, surfType, spare3, reflctUncorr, reflCor_atm, SigmaElv, kurt2, ElvUseFlg, spare4, SurfRuf_slpQF, elvflg, rng_UQF, atmQF, timecorflg, spare5; reorganized and standardized structure and software

GLA12_alg_mod - added Version 3 variables to structure, print module, and initialization code; includes additions of and/or changes to deltagpstmcor, sigmaatt, tpintensity_avg, tpazimuth_avg, tpeccentricity_avg, tpmajoraxis_avg, surfType, reflctUncorr, reflCor_atm, SigmaElv, kurt2, ElvUseFlg, SurfRuf_slpQF, elvflg, rng_UQF, atmQF, timecorflg; reorganized and standardized structure and software

GLA12_scal_mod mod - added Version 3 variables to scaling structure, print module, and initialization code; includes additions of and/or changes to deltagpstmcor, sigmaatt, tpintensity_avg, tpazimuth_avg, tpeccentricity_avg, tpmajoraxis_avg, surfType, reflctUncorr, reflCor_atm, SigmaElv, kurt2; use of new routines for flag packing/unpacking; reorganized and standardized structure and software

- Branch cr20020822-002-13

GLA13_prod_mod – added Version 3 variables to structure, print module, and initialization code; includes additions of and/or changes to spare1, deltagpstmcor, sigmaatt, tpintensity_avg, tpazimuth_avg, tpeccentricity_avg, tpmajoraxis_avg, surfType, spare3, reflctUncorr, reflCor_atm, SigmaElv, RufSeaIce, ElvUseFlg, spare4, elvflg, rng_UQF, atmQF, timecorflg, spare5; reorganized and standardized structure and software

GLA13_alg_mod - added Version 3 variables to structure, print module, and initialization code; includes additions of and/or changes to deltagpstmcor, sigmaatt, tpintensity_avg, tpazimuth_avg, tpeccentricity_avg, tpmajoraxis_avg, surfType, reflctUncorr, reflCor_atm, SigmaElv, RufSeaIce, ElvUseFlg, elvflg, SiRufQF, atmQF, and timecorflg; reorganized and standardized structure and software

GLA13_scal_mod mod - added Version 3 variables to scaling structure, print module, and initialization code; includes additions of and/or changes to deltagpstmcor, sigmaatt, tpintensity_avg, tpazimuth_avg, tpeccentricity_avg, tpmajoraxis_avg, reflctUncorr, reflCor_atm, SigmaElv, RufSeaIce; use of new routines for flag packing/unpacking; reorganized and standardized structure and software

- Branch cr20020822-002-14

GLA14_prod_mod – added Version 3 variables to structure, print module, and initialization code; includes additions of and/or changes to spare1, deltagpstmcor, sigmaatt, tpintensity_avg, tpazimuth_avg, tpeccentricity_avg, tpmajoraxis_avg, surfType, spare3, reflctUncorr, reflCor_atm, SigmaElv, ElvUseFlg, SurfRuf_slpQF, elvflg, rng_UQF, atmQF, timecorflg, spare5; reorganized and standardized structure and software

GLA14_alg_mod - added Version 3 variables to structure, print module, and initialization code; includes additions of and/or changes to deltagpstmcor, sigmaatt, tpintensity_avg, tpazimuth_avg, tpeccentricity_avg, tpmajoraxis_avg, surfType, reflctUncorr, reflCor_atm, SigmaElv, ElvUseFlg, SurfRuf_slpQF, elvflg, rng_UQF, atmQF, timecorflg; reorganized and standardized structure and software

GLA14_scal_mod mod - added Version 3 variables to scaling structure, print module, and initialization code; includes additions of and/or changes to deltagpstmcor, sigmaatt, tpintensity_avg, tpazimuth_avg, tpeccentricity_avg, tpmajoraxis_avg, reflctUncorr, reflCor_atm, SigmaElv, RufSeaIce; use of new routines for flag packing/unpacking; reorganized and standardized structure and software

- Branch cr20020822-002-15

GLA15_prod_mod – added Version 3 variables to structure, print module, and initialization code; includes additions of and/or changes to spare1, deltagpstmcor, sigmaatt, tpintensity_avg, tpazimuth_avg, tpeccentricity_avg, tpmajoraxis_avg, spare2, surfType, spare3, reflctUncorr, reflCor_atm, SigmaElv, OCRufRMS, OcMeanElev, ElvUseFlg, elvflg, rng_UQF, atmQF, timecorflg, spare5; reorganized and standardized structure and software

GLA15_alg_mod - added Version 3 variables to structure, print module, and initialization code; includes additions of and/or changes to deltagpstmcor, sigmaatt, tpintensity_avg, tpazimuth_avg, tpeccentricity_avg, tpmajoraxis_avg, surfType, reflctUncorr, reflCor_atm, SigmaElv, OCRufRMS, OcMeanElev, ElvUseFlg, elvflg, rng_UQF, atmQF, timecorflg; reorganized and standardized structure and software

GLA15_scal_mod mod - added Version 3 variables to scaling structure, print module, and initialization code; includes additions of and/or changes to deltagpstmcor, sigmaatt, tpintensity_avg, tpazimuth_avg, tpeccentricity_avg, tpmajoraxis_avg, surfType, reflctUncorr, reflCor_atm, SigmaElv, OCRufRMS, OcMeanElev; use of new routines for flag packing/unpacking; reorganized and standardized structure and software

- Branch cr20020822-002misc

GLA13_flags_mod - removed surface roughness routines for placement in the common_flags module

GLA15_flags_mod - removed surface roughness routines for placement in the common_flags module

The format of the attitude flag 1 (AttFlg1) was altered for version 3, along with the packing/unpacking software in the common_flags module. This necessitated small changes involving this flag for all of the following modules:

GLA07_prod_mod, GLA08_ prod _mod, GLA09_ prod _mod, GLA10_ prod _mod, GLA11_ prod _mod, GLA07_alg_mod, GLA08_alg_mod, GLA09_alg_mod, GLA10_alg_mod, GLA11_alg_mod, GLA08_scal_mod, GLA09_scal_mod, GLA10_scal_mod, GLA11_scal_mod

- Branch wcr20020822-002flg

Common_flags_mod - added in routines from GLA15_flags and GLA13_flags which handle variables that have become "communized" with Version 3 format changes; added and/or updated routines for packing/unpacking flags for elvflg, timecorflg, RnfOffQF, SurfRufSlopeQF, ElvUseFlg, CorStatFlg, RngCorrFlg, AttFlg1, orbFlg, surfType, atmQF; added documentation to show changes to flag values and formatting

- Branch 20020918-002

Implemented latest (Rev-E) Telemetry. Modified GLA03 and GLA02 product formats to be compatible with latest Telemetry. Modified L_Eng and L_Atm to be compatible with new GLA03 and GLA02 formats. Changed GLA06 record length to be divisible by 4.

Due to a problem when computing 1064 energy, changed the 1064 energy value passed to L_Atm to gd_invalid_r8b, which will indicate that L_Atm needs to use a default value for 1064 energy.

Updated L1A_Mgr so that missing data was handled more correctly with regards to GLA03. Also made temporary fix such that the last good engineering value is used for those parameters which use engineering values in calculations.

Updated value of gd_volt_offset to 0.840 (from CR20020923-002).

Modified L1A_Mgr to call the geolocation routines but once per second. Was previously calling the geolocation routines at a rate of 40 per second (CR20020821-001).

Created "splitter", a utility to subset GLA00 APIDs. This will not be used in production work but is delivered as part of the GSAS product utilities.(CR20020912-001).

Updated version numbers of all libraries and data files to reflect version 2.4.

Updated value for gi_Tb_1064 per Steve Palm email.

Updated d_tdelay_digtzr value in the current ANC33 file per Hancock email.

Added a call to wf_globals_print in the ANC07 print routine.

• Branch CR20020911-003

The c_calcsploc_mod.f90, c_intrppod_mod.f90, anc09_pad_mod.f90 routines have been modified to take into account the GPS-UTC leap second table.

The control files for GLAS_Atm, GLAS_Alt, and GLAS_L1A will have to have to be modified to include an additional input line:

INPUT_FILE=anc25 filename   (e.g. anc25_001_01_0000.dat)

The createGran utility has also been modified to take into account the GPS-UTC leap second table. The routines that have been modified are: rd_GranCntrl_mod.f90,

pop_granule_mod.f90, and createGran_util.f90.   The control file will need to be modified to include:

IN_ANC25FILE= anc25 filename   (e.g. anc25_001_01_0000.dat)

All the times output by the createGran utility will be in J2000 UTC seconds. The ANC04, ANC08, ANC09, ANC20, and ANC22 files will have their times in GPS.

• Branch cr20020201-002-v3

Implemented new time compression algorithms for waveforms.

• Branch pr20020506-001

Fixed the following:

In W_DetGeo, the preliminary uncorrected range for shots 2-40 (d_preRngUncor(iWF)) is calculated from the preliminary range offset of the first shot (d_preRngOff(1)) instead of using the offset for the current shot (d_preRngOff(iWF)). This error is present in both release versions 2.0 and 2.1.

In W_SmoothPreRC, the range offsets (d_minRngOff, d_maxRngOff, & d_preRngOff) are calculated using the time of a gate near the threshold crossing instead of interpolating the time of the threshold crossing.

• Branch cr20020510-003

The range window status needs to be checked. in APID 12 starting byte 120 the status word. Offset 38 - All filters were rejected flag (meaning 0=All filters were not rejected; 1=All filters were rejected. This flag will be set to true (1) if bits 0 through 5 in Range_Status are set.)

If all filters are rejected the mean background and its standard deviation are not processed so their contain is undetermined in tlm. (Could be anything).

Need to check bit and if set make 4 ns mean background and STD invalid values.

The L1a changes have been made. When all filters were rejected, the observed noise and standard deviation of noise are set to d_invalid_r8b.

• Branch cr20020724-002

d_tdelay_digtzr & d_rDelay_digtzr (the digitizer time and internal range delays), and d_plTbias & d_plRbias (the post launch time and range biases) have been added to g_anc33 in anc33_utc_mod.

Fixed Syncing problem for anc25 & anc33 in time_conversion_mod, shot_time_mod, & ReadData_mod. Added location of transmitted pulse peak to calculation of shot time in shot_time_mod.These values are all time dependent and so were added to anc33 instead of anc07.

anc33 has been updated to include d_tdelay_digtzr (time delay for digitizer in sec), d_rDelay_digtzr (internal range delay for digitizer in m), d_plTbias (post launch time bias in sec), and d_plRbias (post launch range bias in m). The index for the anc33 array is now updated for each shot, if necessary.

5.5.3   Changes Delivered in V3.0

Minor changes were implemented between the release of V2.4 and V3.0. These changes were new requirements and minor fixes to problems found in MOSS10 testing.

The ClearCase label for this release will be RELEASE_3.0.

The following is a list of changes implemented into v3.0. See the appropriate CATU entry for more information regarding each specific change.

- PR20021007-001

Fixed the LRS tracker subject (PR20021021-003).
Fixed the LRS VTCentR/VTCentC scales (CR20021021-002).
Fixed the ANC32 data synchronization problem (PR20021021-001).

- CR20021015-002

Add internal delays to prap VTCW conversion.
Fix LRS/IST alignment problem resulting from addition of delay.
Changed internal version numbers to 3.0.

- PR20021015-002

Fixed data alignment problem in GLA03.
Fixed data alignment problem in GLA11.

- PR20021025-002

This fixes a bug in the calculation of signal begin & signal end in waveforms.

- PR20021022-001

The c_intrpPOD and c_calcSpLoc routines (for POD interpolation, and geolocation) have been modified to compare the data time (in UTC) against the corresponding ancillary file start/stop time in the control file. The previous version of the code used to check the GPS time.

- PR20021023-002

The createGran_util utility has been modified to check if the reference orbit end time is zero or not. If it is zero, no GPS/UTC leap second correction will be applied when running the utility in the REFORB mode. This is essential because a zero end time is used to indicate that there is no reference orbit file after this one.

- • pr20021016-001

The following scal mods were using gi_invalid_i4b instead of gi_invalid_i2b:

GLA06_scal_mod.f90
GLA10_scal_mod.f90 (CATU pr20021016-004)
GLA12_scal_mod.f90
GLA13_scal_mod.f90
GLA14_scal_mod.f90
GLA15_scal_mod.f90

- • pr20021016-002

WFMgr & ElevMgr need to check for the existence of ANC09 before using it.

5.6   Changed Files

The following files were changed since the versions provided in RELEASE_2.4:

```
/glas/vob/Makefile@@/main/11
/glas/vob/data/anc07_001_01_0000.dat@@/main/9
/glas/vob/data/anc07_001_01_0001.dat@@/main/8
/glas/vob/data/anc07_001_01_0002.dat@@/main/5
/glas/vob/data/anc07_001_01_0003.dat@@/main/4
/glas/vob/data/anc07_001_01_0004.dat@@/main/7
/glas/vob/data/anc07_001_01_0005.dat@@/main/6
/glas/vob/data/anc46_001_01_0004.dat@@/main/1
/glas/vob/data/anc46_001_01_0008.dat@@/main/1
/glas/vob/data/anc46_001_01_0009.dat@@/main/1
/glas/vob/data/anc46_001_01_0020.dat@@/main/1
/glas/vob/data/anc46_001_01_0022.dat@@/main/1
/glas/vob/data/anc46_001_01_0025.dat@@/main/1
/glas/vob/data/anc46_001_01_0033.dat@@/main/1
/glas/vob/data/anc46_001_01_0037.dat@@/main/1
/glas/vob/data/anc46_001_01_0039.dat@@/main/1
/glas/vob/data@@/main/7
/glas/vob/src/Makefile@@/main/12
/glas/vob/src/atm_anc/A_seg_cal_cofs_mod.f90@@/main/4
/glas/vob/src/atm_lib/vers_atm_mod.f90@@/main/5
/glas/vob/src/atmosphere/layers/A_cld_det_mod.f90@@/main/3
/glas/vob/src/atmosphere/layers/A_cld_grd_det_mod.f90@@/main/3
/glas/vob/src/atmosphere/layers/A_cld_lays_mod.f90@@/main/5
/glas/vob/src/atmosphere/layers/A_pbl_lay_mod.f90@@/main/5
/glas/vob/src/atmosphere/opt_props/test/A_aer_test1.reference@@/main/0
/glas/vob/src/atmosphere/opt_props/test/data@@/main/0
/glas/vob/src/atmosphere/opt_props/test/makefile@@/main/1
/glas/vob/src/atmosphere/opt_props/test/read_cntrl_mod.f90@@/main/0
/glas/vob/src/atmosphere/opt_props/test/read_met_mod.f90@@/main/0
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Abbreviations & Acronyms

A2P	Algorithm-to-Product Conversion
ALT	Altimeter or Altimetry, also designation for the EOS-Altimeter spacecraft series
ANCxx	GLAS Ancillary Data Files
APID	GLAS Level-0 Data file
ATBD	Algorithm Theoretical Basis Document
ATM	Atmosphere
CCB	Change Control Board
ClearCase	GSAS version tracking software
CR	Change Request
DAAC	Distributed Active Archive Center
DEM	Digital Elevation Model
DFD	Data Flow Diagram
DLT	Digital Linear Tape
EDOS	EOS Data and Operations System
EDS	Expedited Data Set
ELEV	Elevation
EOC	EOS Operating Center
EOS	NASA Earth Observing System Mission Program
EOSDIS	Earth Observing System Data and Information System
GB	Gigabyte
GDS	GLAS Ground Data System
GLAS	Geoscience Laser Altimeter System instrument or investigation
GLAxx	GLAS Science Data Product Files
GLOP	GLAS Level-0 PGE (correctly called GLAS_L0proc)
GPS	Global Positioning System
GSAS	GLAS Science Algorithm Software
GSFC	NASA Goddard Space Flight Center at Greenbelt, Maryland
GSFC/WFF	NASA Goddard Space Flight Center/Wallops Flight Facility at Wallops Island, Virginia

HDF	Hierarchal Data Format
HDF-EOS	EOS-specific Hierarchal Data Format
I-SIPS	Icesat Science Investigator Led Processing System
I/O	Input/Output
ICESAT	Ice, Cloud and Land Elevation Satellite
ID	Identification
IEEE	Institute for Electronics and Electrical Engineering
ISF	Instrument Support Facility
IST	Instrument Star Tracker
KB	Kilobyte
L0	Level 0
L1A	Level-1A
L1B	Level-1 B
L2	Level-2
LASER	Light Amplification by Stimulated Emission of Radiation
LIDAR	Light Detection and Ranging
LPA	Laser Pointing Array
LRS	Laser Reference System
MB	Megabyte
MET	(context sensitive) Mission Elapsed Time or Meteorological
MOSS	Mission Operations Science Simulation (test)
N/A or NA	Not (/) Applicable
NASA	National Aeronautics and Space Administration
NOAA	National Oceanic and Atmospheric Administration
P2A	Product-to-Algorithm Conversion
PAD	Precision Attitude Determination
PDF	Portable Document Format
PDS	Production Data Set
PGE	Product Generation Executable
POD	Precision Orbit Determination
PR	Problem Report
QA	Quality Assessment

QAP	Quality Assessment Processing
SC	Structure Chart
SCF	Science Computing Facility
SDMP	Science Data Management Plan
SDMS	Scheduling and Data Management System
SDP	Standard Data Products
SRS	Stellar Reference System
SSMP	Science Software Management Plan
SSRF	Science Software Requirements Document
TBD	to be determined, to be done, or to be developed
UNIX	the operating system jointly developed by the AT&T Bell Laboratories and the University of California-Berkeley System Division
UTC	Universal Time Correlation
WF	Waveform
A2P	Algorithm-to-Product Conversion
ALT	Altimeter or Altimetry, also designation for the EOS-Altimeter spacecraft series
ANCxx	GLAS Ancillary Data Files
APID	GLAS Level-0 Data file
ATBD	Algorithm Theoretical Basis Document

Glossary

aggregate
A collection, assemblage, or grouping of distinct data parts together to make a whole. It is generally used to indicate the grouping of GLAS data items, arrays, elements, and EOS parameters into a data record. For example, the collection of Level 1B EOS Data Parameters gathered to form a one-second Level 1B data record. It could be used to represent groupings of various GLAS data entities such as data items aggregated as an array, data items and arrays aggregated into a GLAS Data Element, GLAS Data Elements aggregated as an EOS Data Parameter, or EOS Data Parameters aggregated into a Data Product record.

array
An ordered arrangement of homogenous data items that may either be synchronous or asynchronous. An array of data items usually implies the ability to access individual data items or members of the array by an index. An array of GLAS data items might represent the three coordinates of a georeference location, a collection of values at a rate, or a collection of values describing an altimeter waveform.

file
A collection of data stored as records and terminated by a physical or logical end-of-file (EOF) marker. The term usually applies to the collection within a storage device or storage media such as a disk file or a tape file. Loosely employed it is used to indicate a collection of GLAS data records without a standard label. For the Level 1A Data Product, the file would constitute the collection of one-second Level 1A data records generated in the SDPS working storage for a single pass.

header
A text and/or binary label or information record, record set, or block, prefacing a data record, record set, or a file. A header usually contains identifying or descriptive information, and may sometimes be embedded within a record rather than attached as a prefix.

item
Specifically, a data item. A discrete, non-decomposable unit of data, usually a single word or value in a data record, or a single value from a data array. The representation of a single GLAS data value within a data array or a GLAS Data Element.

label
The text and/or binary information records, record set, block, header, or headers prefacing a data file or linked to a data file sufficient to form a labeled data product. A standard label may imply a standard data product. A label may consist of a single header as well as multiple headers and markers depending on the defining authority.

Level 0
The level designation applied to an EOS data product that consists of raw instrument data, recorded at the original resolution, in time order, with any duplicate or redundant data packets removed.

Level 1A
The level designation applied to an EOS data product that consists of reconstructed, unprocessed Level 0 instrument data, recorded at the full resolution with time referenced data records, in time order. The data are annotated with ancillary information including radiometric and geometric calibration coefficients, and georeferencing parameter data (i.e., ephemeris data). The included, computed coefficients and parameter data have not however been applied to correct the Level 0 instrument data contents.

Level 1B	The level designation applied to an EOS data product that consists of Level 1A data that have been radiometrically corrected, processed from raw data into sensor data units, and have been geolocated according to applied georeferencing data.
Level 2	The level designation applied to an EOS data product that consists of derived geophysical data values, recorded at the same resolution, time order, and geo-reference location as the Level 1A or Level 1B data.
Level 3	The level designation applied to an EOS data product that consists of geo-physical data values derived from Level 1 or Level 2 data, recorded at a tem-porally or spatially resampled resolution.
Level 4	The level designation applied to an EOS data product that consists of data from modeled output or resultant analysis of lower level data that are not directly derived by the GLAS instrument and supplemental sensors.
metadata	The textual information supplied as supplemental, descriptive information to a data product. It may consist of fixed or variable length records of ASCII data describing files, records, parameters, elements, items, formats, etc., that may serve as catalog, data base, keyword/value, header, or label data. This data may be parsable and searchable by some tool or utility program.
orbit	The passage of time and spacecraft travel signifying a complete journey around a celestial or terrestrial body. For GLAS and the EOS ALT-L spacecraft each orbit starts at the time when the spacecraft is on the equator traveling toward the North Pole, continues through the equator crossing as the space-craft ground track moves toward the South Pole, and terminates when the spacecraft has reached the equator moving northward from the South Polar region.
module	A collection of program statements with four basic attributes: input and output, function, mechanics and internal data.
pass	A sub-segment of an orbit, it may consist of the ascending or descending por-tion of an orbit (e.g., a descending pass would consist of the ground track seg-ment beginning with the northernmost point of travel through the following southernmost point of travel), or the segment above or below the equator; for GLAS the pass is identified as either the northern or southern hemisphere por-tion of the ground track on any orbit
product	Specifically, the Data Product or the EOS Data Product. This is implicitly the labeled data product or the data product as produced by software on the SDPS or SCF. A GLAS data product refers to the data file or record collection either prefaced with a product label or standard formatted data label or linked to a product label or standard formatted data label file. Loosely used, it may indicate a single pass file aggregation, or the entire set of product files con-tained in a data repository.
program	The smallest set of computer instructions that can be executed as a stand-alone unit
record	A specific organization or aggregate of data items. It represents the collection of EOS Data Parameters within a given time interval, such as a one-second data record. It is the first level decomposition of a product file.
Scenario	A single execution path for a process.

Standard Data Product	Specifically, a GLAS Standard Data Product. It represents an EOS ALT-L/ GLAS Data Product produced on the EOSDIS SDPS for GLAS data product generation or within the GLAS Science Computing Facility using EOS science community approved algorithms. It is routinely produced and is intended to be archived in the EOSDIS data repository for EOS user community-wide access and retrieval.
Subroutine	A program that is called by another program
variable	Usually a reference in a computer program to a storage location, i.e., a place to contain or hold the value of a data item.